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**PRELIMINARY**  
**September 20, 2002**

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**GROUNDWATER  
SERVICES, INC.**

*61*

Mr. Richard Williams  
Solutia, Inc.  
W.G. Krummrich Plant  
500 Monsanto Avenue  
Sauget, Illinois 62206-1198

EPA Region 5 Records Ctr.



277956

Re: Preliminary results of volatile organic compound and semi volatile organic compound groundwater transport analysis and comparison to ecological benchmark, W.G. Krummrich Plant, Sauget, Illinois

Dear Mr. Williams:

In accordance with your request, Groundwater Services, Inc. (GSI) has completed an analysis of groundwater transport of volatile and semi volatile organic compounds in the vicinity of the W.G. Krummrich Plant in Sauget, Illinois. The study was conducted to evaluate the extent of constituent migration toward the Mississippi River and to predict constituent concentrations proximate to the river. This letter summarizes the approach and results of the groundwater transport analysis and a comparison of predicted river discharge concentrations to 10 times the ecological benchmark.

## **EXECUTIVE SUMMARY**

- The objective of this study was to evaluate the potential impact of volatile and semi volatile organic compounds from an area west of the W.G. Krummrich Plant in Sauget, Illinois on the Mississippi River.
- A groundwater transport analysis was performed using data collected from three monitoring locations west of the W.G. Krummrich Plant to predict river discharge concentrations of constituents of concern. The predicted concentrations were compared to 10 times the ecological benchmark in order to determine impact on the river.
- Results of the groundwater transport analysis, performed using both arithmetically averaged and maximum measured values, predict that no constituents of concern exceed 10 times the ecological benchmark concentration at the river based on extrapolated concentration trends or first-order decay calculations using TACO degradation rates.

## **INTRODUCTION**

GSI recently conducted a groundwater sampling and testing program at three locations west of the W.G. Krummrich Plant (Figure 1). The three monitoring locations, AA-GWM-S1, AA-GWM-S2, and AA-GWM-S3 represent a general groundwater flowpath

from the Lot F area toward the Mississippi River (referred to as the Lot F transect throughout this report). Data from the groundwater sampling program indicates the presence of several dissolved volatile organic compounds (VOCs) and semi volatile organic compounds (SVOCs) in the Lot F transect (Figure 2). Concentrations of constituents of concern (COCs) at a river discharge point were predicted through groundwater transport analysis of the data from the sampling program. The predicted constituent concentration at the river was compared to 10 times the ecological benchmark concentration for each respective compound to determine the impact of COCs from the Lot F transect on the river.

## **FIELD PROCEDURES**

The groundwater sampling program was conducted by GSI during the period of July 15, 2002 through July 25, 2002. Groundwater samples were analyzed by Severn Trent Laboratories (STL) in Savannah, GA and Sacramento, CA. A summary of field procedures for the groundwater sampling program including monitoring locations, target depths, analytes, and laboratory methods has been submitted previously (GSI, 2002). The resulting groundwater data that was utilized in the present transport analysis has not been validated and therefore should be considered preliminary.

## **GROUNDWATER TRANSPORT ANALYSIS METHODS**

### **Conceptual Site Model**

The area in the vicinity of the W.G. Krummrich Plant is located in the Mississippi River floodplain in an area referred to as the American Bottoms. The alluvial aquifer underlying the area in the vicinity of the W.G. Krummrich Plant is described as consisting of valley fill deposits (Cahokia Alluvium) overlying glacial outwash material (Henry Formation). In general, the permeability of the alluvial aquifer increases with depth, with the valley fill material being comprised of silts and fine sands and the outwash material being comprised of medium to coarse sand and gravel. Groundwater flow in the area is in a westerly direction towards the river. The following table describes the three hydrogeologic zones in the alluvial aquifer.

<b>Hydrogeologic Zone</b>	<b>Approximate Depth (ft., MSL)</b>	<b>Seepage Velocity (ft/day) (Solutia, 2002)</b>
Shallow	380 - 395	0.02
Intermediate	350 - 380	4.00
Deep	270 - 350	6.00

The alluvial aquifer is underlain by limestone and dolomite bedrock.

Previous groundwater sampling in the Sauget area has indicated elevated levels of VOCs (e.g. benzene, chlorobenzene), SVOCs (e.g. dichlorobenzene, naphthalene), pesticides, herbicides, PCBs, and metals. Source materials in the Sauget area result from historical practices of industrial and municipal waste disposal in landfills and waste pits. These disposal practices occurred from the 1950's to the 1970's (Solutia, 2002). Due to the historical nature of the source material, the sourcing of constituents to groundwater is likely constant or declining over time. Therefore, the groundwater plume is likely to have reached a steady state condition that permits use of an extrapolation based trend analysis.

### Methods of Transport Analysis

Three methods of evaluating COC transport through the Lot F transect were utilized to predict COC concentration at a hypothetical discharge point near the Mississippi River. The resulting predicted concentration was compared to 10 times the ecological benchmark for the respective COC to determine whether a potential impact to the river exists. Ecological benchmark concentrations were obtained from the "Ecological Risk Assessment for Sauget Area 1" report (Menzie-Cura, 2000) and the *Guidance for Conducting Ecological Risk Assessment at Remediation Sites in Texas* (TNRCC, 2001). The three methods of COC transport analysis were performed for each hydrogeologic zone using both average values detected within each respective zone (non-detects quantified as 0.5 x detection limit) and maximum values detected within each hydrogeologic zone. The three methods of COC transport evaluated are:

- **Transport with No Attenuation:** This method of transport analysis assumes that the average or maximum COC concentration detected within each hydrogeologic zone at monitoring location AA-GWM-S1 (location nearest river, approximately 1350 ft. upgradient) is conserved throughout transport to the river. Processes such as dispersion, sorption, and biodegradation are neglected. The average or maximum concentration within each zone at AA-GWM-S1 was then compared to 10 times the ecological benchmark. If the evaluated COC concentration was below 10 times the ecological benchmark then no further transport analysis was performed for that COC. If the evaluated COC concentration exceeded 10 times the ecological benchmark at the monitoring location nearest the river, then the following method of transport analysis was performed.
- **Transport with Attenuation Based on Extrapolated Trend:** For COCs exceeding 10 times the ecological benchmark at the monitoring location nearest the river, a regression analysis was performed by plotting the natural log of the average or maximum COC concentration at each monitoring location against distance. The resulting trend was then extrapolated and the COC concentration at the river was predicted. Fate and transport processes such as dispersion, sorption, and biodegradation are accounted for using this approach. If the predicted COC concentration was below 10 times the ecological benchmark then no further

transport analysis was performed for that COC. If the predicted COC concentration exceeded 10 times the ecological benchmark or a uniformly decreasing trend was not established, then a third method of transport analysis was performed.

- **Transport with Attenuation Based on TACO Degradation Rates:** For COCs with a predicted concentration at the river exceeding 10 times the ecological benchmark based on the extrapolated trend, a first order decay calculation was performed using first order degradation rates obtained from Tiered Approach to Corrective Action Objectives (TACO) (35 IAC 742). The calculation was performed using both the average and maximum COC concentration within each hydrogeologic zone at the monitoring location nearest the river as the initial concentration. The value nearest the river was selected as the initial concentration since the groundwater plume is assumed to be at steady-state.

## GROUNDWATER TRANSPORT ANALYSIS RESULTS

Groundwater transport analysis of VOCs and SVOCs was performed using two approaches: an average value approach and a maximum value approach. The average value approach is a more reasonable evaluation of potential impact of COCs on the river, while the maximum value approach represents a more conservative evaluation. Table 1 and Table 2 provide summaries of the transport analysis obtained using average values and maximum values, respectively.

### Average Value Approach

For the average value approach, measured COC concentrations at each monitoring location were arithmetically averaged within each hydrogeologic zone. COCs that were not detected were quantified as one-half the reported detection limit. The results of the transport analysis using average COC concentrations for constituents with a detectable concentration at the monitoring location nearest the river (AA-GWM-S1) are summarized in Table 1.

- **Shallow Hydrogeologic Zone:** Three VOCs, benzene, chlorobenzene, and methylene chloride, had detectable concentrations in the shallow hydrogeologic zone at monitoring location AA-GWM-S1 (note that only one sample was taken in the shallow zone, therefore, average and maximum values are identical). However, the detected concentrations of all COCs were below 10 times the ecological benchmark, therefore, no further transport analysis of these COCs was required. No SVOCs were detected in the shallow hydrogeologic zone in the Lot F transect.
- **Intermediate Hydrogeologic Zone:** Only one VOC, chloromethane, was detected in the intermediate hydrogeologic zone at monitoring location AA-GWM-S1 (note that only one sample was taken in the intermediate zone, therefore, average and maximum values are identical). Chloromethane was detected at 0.0009 mg/L, which

is less than 10 times the ecological benchmark. No SVOCs were detected in the intermediate hydrogeologic zone at monitoring location AA-GWM-S1.

- **Deep Hydrogeologic Zone:** Several VOCs and SVOCs were detected in the deep hydrogeologic zone at monitoring location AA-GWM-S1. However, only one COC, chlorobenzene, had a concentration exceeding 10 times the ecological benchmark. Transport analysis based on extrapolating the trend in average concentrations along the Lot F transect predicted a river discharge concentration less than 10 times the ecological benchmark for chlorobenzene (calculation found in Table 3). Two detected COCs, chloroethane and 4-chloroaniline, do not have ecological benchmark concentrations. The average detected concentrations of chloroethane and 4-chloroaniline at monitoring location AA-GWM-S1 are 0.0097 mg/L and 0.006 mg/L, respectively (TACO Tier 1 Groundwater Remediation Objective for 4-chloroaniline = 0.028 mg/L; no value for chloroethane (35 IAC 742)).

#### Key Finding

*Only chlorobenzene, in the deep hydrogeologic zone, had an average concentration exceeding 10 times the ecological benchmark at the monitoring location nearest the river. Transport analysis based on the extrapolated average concentration trend predicted a river discharge concentration less than 10 times the ecological benchmark for chlorobenzene.*

#### Maximum Value Approach

For the maximum value approach, the maximum measured COC concentration at each monitoring location within each hydrogeologic zone was utilized in the transport analysis. The results of the transport analysis using maximum COC concentrations for constituents with a detectable concentration at the monitoring location nearest the river (AA-GWM-S1) are summarized in Table 2.

- **Shallow Hydrogeologic Zone:** Three VOCs, benzene, chlorobenzene, and methylene chloride, had detectable concentrations in the shallow hydrogeologic zone at monitoring location AA-GWM-S1 (note that only one sample was taken in the shallow zone, therefore, average and maximum values are identical). However, the detected concentrations of all COCs were below 10 times the ecological benchmark, therefore, no further transport analysis of these COCs was required. No SVOCs were detected in the shallow hydrogeologic zone in the Lot F transect.
- **Intermediate Hydrogeologic Zone:** Only one VOC, chloromethane, was detected in the intermediate hydrogeologic zone at monitoring location AA-GWM-S1 (note that only one sample was taken in the intermediate zone, therefore, average and maximum values are identical). Chloromethane was detected at 0.0009 mg/L, which is less than 10 times the ecological benchmark. No SVOCs were detected in the intermediate hydrogeologic zone at monitoring location AA-GWM-S1.

- **Deep Hydrogeologic Zone:** Several VOCs and SVOCs were detected in the deep hydrogeologic zone at monitoring location AA-GWM-S1. Two COCs, chlorobenzene and 1,4-dichlorobenzene, had maximum concentrations exceeding 10 times the ecological benchmark. For chlorobenzene, transport analysis based on extrapolating the trend in maximum concentrations along the Lot F transect predicted a river discharge concentration less than 10 times the ecological benchmark (calculation found in Table 5). For 1,4-dichlorobenzene, however, there was not a uniformly decreasing trend along the Lot F transect and a transport analysis based on extrapolated trend could not be performed. Transport analysis based on first order degradation using the maximum detected concentration at location AA-GWM-S1 and the TACO degradation rate predicted the 1,4-dichlorobenzene concentration at the river to be less than 10 times the ecological benchmark (calculation found in Table 10). Two detected COCs, chloroethane and 4-chloroaniline, do not have ecological benchmark concentrations. The maximum detected concentrations of chloroethane and 4-chloroaniline at monitoring location AA-GWM-S1 are 0.011 mg/L and 0.012 mg/L, respectively (TACO Tier 1 Groundwater Remediation Objective for 4-chloroaniline = 0.028 mg/L; no value for chloroethane (35 IAC 742)).

#### Key Finding

*Chlorobenzene and 1,4-dichlorobenzene, in the deep hydrogeologic zone, had maximum concentrations exceeding 10 times the ecological benchmark at the monitoring location nearest the river. Transport analysis based on the extrapolated maximum concentration trend predicted a river discharge concentration less than 10 times the ecological benchmark for chlorobenzene. Transport analysis based on TACO first-order degradation rates predicted a river discharge concentration less than 10 times the ecological benchmark for 1,4-dichlorobenzene.*

We have enjoyed working with you on this project. If you have any further questions please do not hesitate to call me or Travis McGuire at (713) 522-6300.

Sincerely,



Charles J. Newell, Ph.D., P.E.  
Vice President



Travis M. McGuire  
Environmental Engineer

Attachments

## **CITED REFERENCES**

### **Site Records and Reports**

GSI, 2002, "Preliminary Results of Groundwater Sampling and Testing at Locations in the Vicinity of the W.G. Krummrich Plant, Sauget, Illinois," Groundwater Services, Inc., Houston, Texas, August 12, 2002.

Menzie-Cura, 2000, "Ecological Risk Assessment for Sauget Area 1, Sauget, St. Clair County, Illinois," Menzie-Cura and Associates, Inc., December 8, 2000.

Solutia, 2002, "Focused Feasibility Study, Volume 1, Interim Groundwater Remedy Sauget Area 2 Sites O, Q, R, and S," Solutia, Inc., March 31, 2002.

### **Published References**

TNRCC, 2001, Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas, TNRCC Publication No. RG-263 (revised), Texas Natural Resource Conservation Commission, Austin, Texas, December 2001.

September 20, 2002



## VOC AND SVOC GROUNDWATER TRANSPORT ANALYSIS AND COMPARISON TO ECOLOGICAL BENCHMARK

Solutia, Inc.  
W.G. Krummrich Plant  
Sauget, Illinois

### Tables

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**TABLE 1**  
**COMPARISON OF MEASURED AVERAGE CONCENTRATIONS DOWNGRADIENT**  
**OF LOT F TO ECOLOGICAL BENCHMARKS**

Solutia Inc., W. G. Krummrich Plant  
 Sauget, Illinois

Lot F Transect Hydrogeologic Zone <sup>5</sup>	Constituent of Concern <sup>1</sup>	Lot F Groundwater Concentrations Exceeds 10 times Ecological Benchmark at River Discharge Point: <sup>4</sup>		
		with no attenuation? <sup>2</sup>	with attenuation based on extrapolated trend? <sup>3</sup>	SUMMARY
Shallow	<b>VOCs</b>			
	Benzene	Not Exceeded		Not Exceeded
	Chlorobenzene	Not Exceeded		Not Exceeded
Intermediate	Methylene chloride	Not Exceeded		Not Exceeded
	Chloromethane	Not Exceeded		Not Exceeded
	Benzene	Not Exceeded		Not Exceeded
Deep	Chlorobenzene	<b>EXCEEDS</b>	Not Exceeded	Not Exceeded
	Chloroethane	No Ecological Benchmark Concentration (See Note 6)		
	Chloromethane	Not Exceeded		Not Exceeded
	1,1-Dichloroethane	Not Exceeded		Not Exceeded
	Toluene	Not Exceeded		Not Exceeded
	Trichloroethene	Not Exceeded		Not Exceeded
	Vinyl chloride	Not Exceeded		Not Exceeded
	<b>SVOCs</b>			
	1,2-Dichlorobenzene	Not Exceeded		Not Exceeded
Deep	1,3-Dichlorobenzene	Not Exceeded		Not Exceeded
	1,4-Dichlorobenzene	Not Exceeded		Not Exceeded
	2-Chlorophenol	Not Exceeded		Not Exceeded
	2,4-Dichlorophenol	Not Exceeded		Not Exceeded
	4-Chloroaniline	No Ecological Benchmark Concentration (See Note 6)		
	bis(2-Ethylhexyl)phthalate	Not Exceeded		Not Exceeded
	Naphthalene	Not Exceeded		Not Exceeded

Notes:

- Only constituents with detectable concentrations at the monitoring location nearest the Mississippi River (AA-GWM-S1) were evaluated.
- The "with no attenuation" value used for comparison to the ecological benchmark represents the average measured concentration at various sample depths within each hydrogeologic zone at the monitoring location downgradient of Lot F nearest the Mississippi River (AA-GWM-S1, approximately 1350 ft. upgradient of Miss. R.).
- Values used for groundwater discharge concentration calculations based on extrapolated trend represent the average of measured concentrations at various sample depths within each hydrogeologic zone. See Figure 2 for sample depths and hydrogeologic zones for each monitoring location.
- Ecological Benchmark concentrations from Table 5.1 of "Ecological Risk Assessment for Sauget Area 1", Menzie-Cura & Associates, 2000 and "Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas", Texas Natural Resource Conservation Commission, 2001.
- Lot F Transect comprised of geoprobe groundwater monitoring locations AA-GWM-S1, AA-GWM-S2, and AA-GWM-S3. See Figure 1 for exact locations.
- The average measured concentration for constituents with no ecological benchmarks are as follows:  
 Chloroethane 0.0097 mg/L  
 4-Chloroaniline 0.006 mg/L

**TABLE 2**  
**COMPARISON OF MEASURED MAXIMUM CONCENTRATIONS DOWNGRADIENT**  
**OF LOT F TO ECOLOGICAL BENCHMARKS**

Solutia Inc., W. G. Krummrich Plant  
Sauget, Illinois

Lot F Transect Hydrogeologic Zone <sup>6</sup>	Constituent of Concern <sup>1</sup>	Lot F Groundwater Concentrations Exceeds 10 times Ecological Benchmark at River Discharge Point. <sup>5</sup>			
		with no attenuation? <sup>2</sup>	with attenuation based on extrapolated trend? <sup>3</sup>	with attenuation based on TACO degradation rates? <sup>4</sup>	SUMMARY
	<b>VOCs</b>				
Shallow	Benzene	Not Exceeded			Not Exceeded
	Chlorobenzene	Not Exceeded			Not Exceeded
	Methylene chloride	Not Exceeded			Not Exceeded
Intermediate	Chloromethane	Not Exceeded			Not Exceeded
Deep	Benzene	Not Exceeded			Not Exceeded
	Chlorobenzene	EXCEEDS	Not Exceeded		Not Exceeded
	Chloroethane	No Ecological Benchmark Concentration (See Note 7)			
	Chloromethane	Not Exceeded			Not Exceeded
	1,1-Dichloroethane	Not Exceeded			Not Exceeded
	Toluene	Not Exceeded			Not Exceeded
	Trichloroethene	Not Exceeded			Not Exceeded
	Vinyl chloride	Not Exceeded			Not Exceeded
	<b>SVOCs</b>				
Deep	1,2-Dichlorobenzene	Not Exceeded			Not Exceeded
	1,3-Dichlorobenzene	Not Exceeded			Not Exceeded
	1,4-Dichlorobenzene	EXCEEDS	Can't Calculate	Not Exceeded	Not Exceeded
	2-Chlorophenol	Not Exceeded			Not Exceeded
	2,4-Dichlorophenol	Not Exceeded			Not Exceeded
	4-Chloroaniline	No Ecological Benchmark Concentration (See Note 7)			
	bis(2-Ethylhexyl)phthalate	Not Exceeded			Not Exceeded
	Naphthalene	Not Exceeded			Not Exceeded

Notes:

- Only constituents with detectable concentrations at the monitoring location nearest the Mississippi River (AA-GWM-S1) were evaluated.
- The "with no attenuation" value used for comparison to the ecological benchmark represents the maximum measured concentration at various sample depths within each hydrogeologic zone at the monitoring location downgradient of Lot F nearest the Mississippi River (AA-GWM-S1, approximately 1350 ft. upgradient of Miss. R.).
- Values used for groundwater discharge concentration calculations based on extrapolated trend represent the maximum of measured concentrations at various sample depths within each hydrogeologic zone. See Figure 2 for sample depths and hydrogeologic zones for each monitoring location.
- Values used for groundwater discharge concentration calculations based on TACO degradation rates represent the maximum of measured concentrations at various sample depths within each hydrogeologic zone at the monitoring location downgradient of Lot F nearest the Mississippi River (AA-GWM-S1, approximately 1350 ft. upgradient of Miss. R.).
- Ecological Benchmark concentrations from Table 5.1 of "Ecological Risk Assessment for Sauget Area 1", Menzie-Cura & Associates, 2000 and "Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas", Texas Natural Resource Conservation Commission, 2001.
- Lot F Transect comprised of geoprobe groundwater sampling locations AA-GWM-S1, AA-GWM-S2, and AA-GWM-S3. See Figure 1 for exact locations.
- The maximum measured concentration for constituents with no ecological benchmarks are as follows:  
Chloroethane 0.011 mg/L  
4-Chloroaniline 0.012 mg/L

TABLE 3  
 PREDICTED VOLATILE ORGANIC COMPOUND (VOC) GROUNDWATER DISCHARGE CONCENTRATIONS  
 FROM LOT F BASED ON EXTRAPOLATED TREND OF MEASURED AVERAGE CONCENTRATIONS

Solutia Inc., W. G. Krummrich Plant  
 Sauget, Illinois

Lot F Transect Shallow Zone

Well	Distance, ft	Benzene	Chlorobenzene	Methylene chloride
AA-GWM-S3	0	0.0005 **	0.089	0.0011
AA-GWM-S1	1875	0.0006	0.0027	0.0011
Estimated Groundwater Concentration at the River		Can't Calculate	2.18E-04	1.10E-03
Ecological Benchmark Concentration		0.13	0.064	2.2
10 times Ecological Benchmark Concentration		1.3	0.64	22
Exceed 10 times Ecological Benchmark Concentration?		Can't Calculate	No	No

Lot F Transect Intermediate Zone

Well	Distance, ft	Chloromethane
AA-GWM-S3	0	0.025 **
AA-GWM-S2	1025	0.004 *
AA-GWM-S1	1875	0.0009
Estimated Groundwater Concentration at the River		8.17E-05
Ecological Benchmark Concentration		55.0
10 times Ecological Benchmark Concentration		550
Exceed 10 times Ecological Benchmark Concentration?		No

Lot F Transect Deep Zone

Well	Distance, ft	Benzene	Chlorobenzene	Chloroethane	Chloromethane
AA-GWM-S3	0	33.3	48.5	0.025 **	0.025 **
AA-GWM-S2	1025	0.022 *	6.53	0.017 **	0.015 *
AA-GWM-S1	1875	0.07	2.53	0.0097 *	0.0085 *
Estimated Groundwater Concentration at the River		1.65E-04	2.57E-01	5.18E-03	4.04E-03
Ecological Benchmark Concentration		0.13	0.064	NA	55.0
10 times Ecological Benchmark Concentration		1.3	0.64	NA	550
Exceed 10 times Ecological Benchmark Concentration?		No	No	Can't Calculate	No

Lot F Transect Deep Zone (Continued)

Well	Distance, ft	1,1-Dichloroethane	Toluene	Trichloroethene	Vinyl chloride
AA-GWM-S3	0	0.025 **	0.038 *	0.025 **	0.025 **
AA-GWM-S2	1025	0.017 **	0.017 **	0.017 **	0.017 **
AA-GWM-S1	1875	0.0105 *	0.010 *	0.011 *	0.017 *
Estimated Groundwater Concentration at the River		5.83E-03	3.71E-03	6.25E-03	1.20E-02
Ecological Benchmark Concentration		0.047	0.0098	0.047	5.63
10 times Ecological Benchmark Concentration		0.47	0.098	0.47	56.3
Exceed 10 times Ecological Benchmark Concentration?		No	No	No	No

NOTES

- Concentrations in milligram per liter (mg/L)
- Concentrations represent average detections in respective hydrogeologic zone
  - \* Constituent at one or more sample intervals within respective hydrogeologic zone was not detected and was quantified as 0.5 x detection limit in order to calculate an average concentration. Constituent was detected in at least one sample interval within the zone
  - \*\* Constituent was not detected at any sample intervals within the respective hydrogeologic zone and was quantified as 0.5 x detection limit.
- River concentrations calculated by obtaining the natural logarithm of the concentration and then estimating the concentration at the river using the TREND function in Microsoft Excel 2000.
- Ecological benchmark concentrations without italics obtained from Tier II concentrations from Table 5.1 of "Ecological Risk Assessment for Sauget Area 1," Menzie-Cura & Associates, 2000. Ecological benchmarks with italics obtained from "Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas," Texas Natural Resource Conservation Commission, 2001. NA = Not available
- Where the trend does not show a uniformly decreasing concentration as the location nears the river, the estimated groundwater concentration at the river is "Can't Calculate".

**TABLE 4**  
**PREDICTED SEMI VOLATILE ORGANIC COMPOUND (SVOC) GROUNDWATER DISCHARGE CONCENTRATIONS**  
**FROM LOT F BASED ON EXTRAPOLATED TREND OF MEASURED AVERAGE CONCENTRATIONS**

Solutia Inc., W. G. Krummrich Plant  
 Sauget, Illinois

***Transect D-4 Deep Zone***

Well	Distance, ft	1,2-Dichlorobenzene	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2-Chlorophenol
AA-GWM-S3	0	0.00556 *	0.00566 *	0.067	0.042
AA-GWM-S2	1025	0.0102	0.00713 *	0.20	0.0483
AA-GWM-S1	1875	0.00715 *	0.00455 *	0.074 *	0.0326
Estimated Groundwater Concentration at the River	3225	Can't Calculate	Can't Calculate	Can't Calculate	Can't Calculate
Ecological Benchmark Concentration		0.014	0.071	0.015	0.13
10 times Ecological Benchmark Concentration		0.14	0.71	0.15	1.3
Exceed 10 times Ecological Benchmark Concentration?		Can't Calculate	Can't Calculate	Can't Calculate	Can't Calculate

***Transect D-4 Deep Zone (Continued)***

Well	Distance, ft	2,4-Dichlorophenol	4-Chloroaniline	bis(2-Ethylhexyl)phthalate	Naphthalene
AA-GWM-S3	0	0.009 *	0.009	0.005 **	0.015
AA-GWM-S2	1025	0.0036 *	0.005 **	0.005 **	0.020 *
AA-GWM-S1	1875	0.0045 *	0.0064	0.005 *	0.00470 *
Estimated Groundwater Concentration at the River	3225	2.18E-03	4.25E-03	5.30E-03	2.97E-03
Ecological Benchmark Concentration		0.085	NA	0.03	0.012
10 times Ecological Benchmark Concentration		0.85	NA	0.3	0.12
Exceed 10 times Ecological Benchmark Concentration?		No	Can't Calculate	No	No

**NOTES**

- Concentrations in milligram per liter (mg/L)
- Concentrations represent average detections in respective hydrogeologic zone.
  - \* Constituent at one or more sample intervals within respective hydrogeologic zone was not detected and was quantified as 0.5 x detection limit in order to calculate an average concentration. Constituent was detected in at least one sample interval within the zone.
  - \*\* Constituent was not detected at any sample intervals within the respective hydrogeologic zone and was quantified as 0.5 x detection limit.
- River concentrations calculated by obtaining the natural logarithm of the concentration and then estimating the concentration at the river using the TREND function in Microsoft Excel 2000.
- Ecological benchmark concentrations without italics obtained from Tier II concentrations from Table 5.1 of "Ecological Risk Assessment for Sauget Area 1," Menzie-Cura & Associates, 2000. Ecological benchmarks with italics obtained from "Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas," Texas Natural Resource Conservation Commission, 2001. NA = Not available
- Where the trend does not show a uniformly decreasing concentration as the location nears the river, the estimated groundwater concentration at the river is "Can't Calculate"

**TABLE 5**  
**PREDICTED VOLATILE ORGANIC COMPOUND (VOC) GROUNDWATER DISCHARGE CONCENTRATIONS**  
**FROM LOT F BASED ON EXTRAPOLATED TREND OF MEASURED MAXIMUM CONCENTRATIONS**

Solutia Inc., W. G. Krummrich Plant  
 Sauget, Illinois

Lot F Transect Shallow Zone

Well	Distance, ft	Benzene	Chlorobenzene	Methylene chloride	
AA-GWM-S3	0	0.0005 **	0.089	0.0011	
AA-GWM-S1	1875	0.0006	0.0027	0.0011	
Estimated Groundwater Concentration at the River		3225	Can't Calculate	2.18E-04	1.10E-03
Ecological Benchmark Concentration			0.13	0.064	2.2
10 times Ecological Benchmark Concentration			1.3	0.64	22
Exceed 10 times Ecological Benchmark Concentration?			Can't Calculate	No	No

Lot F Transect Intermediate Zone

Well	Distance, ft	Chloromethane
AA-GWM-S3	0	0.025 **
AA-GWM-S2	1025	0.004 *
AA-GWM-S1	1875	0.0009
Estimated Groundwater Concentration at the River		3225 8.17E-05
Ecological Benchmark Concentration		55.0
10 times Ecological Benchmark Concentration		550
Exceed 10 times Ecological Benchmark Concentration?		No

Lot F Transect Deep Zone

Well	Distance, ft	Benzene	Chlorobenzene	Chloroethane	Chloromethane	
AA-GWM-S3	0	74	100	0.025 **	0.025 **	
AA-GWM-S2	1025	0.023	7.8	0.017 **	0.021	
AA-GWM-S1	1875	0.079	3.7	0.011	0.0064	
Estimated Groundwater Concentration at the River		3225	9.77E-05	2.54E-01	6.25E-03	3.03E-03
Ecological Benchmark Concentration			0.13	0.064	NA	55.0
10 times Ecological Benchmark Concentration			1.3	0.64	NA	550
Exceed 10 times Ecological Benchmark Concentration?			No	No	Can't Calculate	No

Lot F Transect Deep Zone (Continued)

Well	Distance, ft	1,1-Dichloroethane	Toluene	Trichloroethene	Vinyl chloride	
AA-GWM-S3	0	0.025 **	0.065	0.025 **	0.025 **	
AA-GWM-S2	1025	0.017 **	0.017 **	0.017 **	0.017 **	
AA-GWM-S1	1875	0.014	0.0036	0.015	0.027	
Estimated Groundwater Concentration at the River		3225	8.97E-03	4.95E-04	9.94E-03	Can't Calculate
Ecological Benchmark Concentration			0.047	0.0098	0.047	5.63
10 times Ecological Benchmark Concentration			0.47	0.098	0.47	56.3
Exceed 10 times Ecological Benchmark Concentration?			No	No	No	Can't Calculate

NOTES:

- Concentrations in milligram per liter (mg/L)
- Concentrations represent maximum detections in respective hydrogeologic zone.
- \*\* Constituent was not detected at any sample intervals within the respective hydrogeologic zone and was quantified as 0.5 x detection limit
- River concentrations calculated by obtaining the natural logarithm of the concentration and then estimating the concentration at the river using the TREND function in Microsoft Excel 2000.
- Ecological benchmark concentrations without italics obtained from Tier II concentrations from Table 5.1 of "Ecological Risk Assessment for Sauget Area 1," Menzie-Cura & Associates, 2000. Ecological benchmarks with italics obtained from "Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas," Texas Natural Resource Conservation Commission, 2001. NA = Not available
- Where the trend does not show a uniformly decreasing concentration as the location nears the river, the estimated groundwater concentration at the river is "Can't Calculate".

TABLE 6  
 PREDICTED SEMI VOLATILE ORGANIC COMPOUND (SVOC) GROUNDWATER DISCHARGE CONCENTRATIONS  
 FROM LOT F BASED ON EXTRAPOLATED TREND OF MEASURED MAXIMUM CONCENTRATIONS

Solutia Inc., W. G. Krummrich Plant  
 Sauget, Illinois

Transect D-4 Deep Zone

Well	Distance, ft	1,2-Dichlorobenzene	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2-Chlorophenol
AA-GWM-S3	0	0.0067	0.007	0.19	0.060
AA-GWM-S2	1025	0.015	0.012	0.36	0.054
AA-GWM-S1	1875	0.013	0.0055	0.18	0.046
Estimated Groundwater Concentration at the River	3225	Can't Calculate	Can't Calculate	Can't Calculate	3.86E-02
Ecological Benchmark Concentration		0.014	0.071	0.015	0.13
10 times Ecological Benchmark Concentration		0.14	0.71	0.15	1.3
Exceed 10 times Ecological Benchmark Concentration?		Can't Calculate	Can't Calculate	Can't Calculate	No

Transect D-4 Deep Zone (Continued)

Well	Distance, ft	2,4-Dichlorophenol	4-Chloroaniline	bis(2-Ethylhexyl)phthalate	Naphthalene
AA-GWM-S3	0	0.0017	0.010	0.005 **	0.031
AA-GWM-S2	1025	0.004	0.005 **	0.005 **	0.028
AA-GWM-S1	1875	0.0023	0.012	0.0009	0.0038
Estimated Groundwater Concentration at the River	3225	Can't Calculate	Can't Calculate	3.84E-04	1.28E-03
Ecological Benchmark Concentration		0.085	NA	0.003	0.012
10 times Ecological Benchmark Concentration		0.85	NA	0.03	0.12
Exceed 10 times Ecological Benchmark Concentration?		Can't Calculate	Can't Calculate	No	No

NOTES.

- Concentrations in milligram per liter (mg/L)
- Concentrations represent maximum detections in respective hydrogeologic zone  
 \*\* Constituent was not detected at any sample intervals within the respective hydrogeologic zone and was quantified as 0.5 x detection limit
- River concentrations calculated by obtaining the natural logarithm of the concentration and then estimating the concentration at the river using the TREND function in Microsoft Excel 2000.
- Ecological benchmark concentrations without italics obtained from Tier II concentrations from Table 5.1 of "Ecological Risk Assessment for Sauget Area 1," Menzie-Cura & Associates, 2000. Ecological benchmarks with italics obtained from "Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas," Texas Natural Resource Conservation Commission, 2001. NA = Not available
- Where the trend does not show a uniformly decreasing concentration as the location nears the river, the estimated groundwater concentration at the river is "Can't Calculate"

**TABLE 7**  
**PREDICTED VOLATILE ORGANIC COMPOUND (VOC) GROUNDWATER DISCHARGE CONCENTRATIONS**  
**FROM LOT F BASED ON TACO DEGRADATION RATES AND MEASURED AVERAGE CONCENTRATIONS**

Solutia Inc., W. G. Krummrich Plant  
 Sauget, Illinois

**Lot F Transect Shallow Zone**

	Benzene	Chlorobenzene	Methylene chloride
Average Concentration at Location Nearest River	0.0006	0.0027	0.0011
Well	AA-GWM-S1-40FT	AA-GWM-S1-40FT	AA-GWM-S1-40FT
Distance to River (ft)	1350	1350	1350
Travel Time (days)	67500	67500	67500
First Order Degradation Constant (d <sup>-1</sup> )	0.0009	0.0023	0.01
<b>Estimated Groundwater Concentration at the River</b>	<b>2.48E-30</b>	<b>1.02E-70</b>	<b>7.81E-297</b>
<b>Ecological Benchmark Concentration</b>	<b>0.13</b>	<b>0.064</b>	<b>2.20</b>
<b>10 times Ecological Benchmark Concentration</b>	<b>1.3</b>	<b>0.64</b>	<b>22</b>
<b>Exceed 10 times Ecological Benchmark Concentration?</b>	<b>No</b>	<b>No</b>	<b>No</b>

**Lot F Transect Intermediate Zone**

	Chloromethane
Average Concentration at Location Nearest River	0.0009
Well	AA-GWM-S1-60FT
Distance to River (ft)	1350
Travel Time (days)	338
First Order Degradation Constant (d <sup>-1</sup> )	NA
<b>Estimated Groundwater Concentration at the River</b>	<b>Can't Calculate</b>
<b>Ecological Benchmark Concentration</b>	<b>55.0</b>
<b>10 times Ecological Benchmark Concentration</b>	<b>550</b>
<b>Exceed 10 times Ecological Benchmark Concentration?</b>	<b>Can't Calculate</b>

**Lot F Transect Deep Zone**

	Benzene	Chlorobenzene	Chloroethane	Chloromethane
Average Concentration at Location Nearest River	0.07	2.53	0.0097 *	0.0085 *
Well	AA-GWM-S1-80FT	AA-GWM-S1-1200FT	AA-GWM-S1-100FT	AA-GWM-S1-140FT
Distance to River (ft)	1350	1350	1350	1350
Travel Time (days)	225	225	225	225
First Order Degradation Constant (d <sup>-1</sup> )	0.0009	0.0023	NA	NA
<b>Estimated Groundwater Concentration at the River</b>	<b>5.72E-02</b>	<b>1.51E+00</b>	<b>Can't Calculate</b>	<b>Can't Calculate</b>
<b>Ecological Benchmark Concentration</b>	<b>0.13</b>	<b>0.064</b>	<b>NA</b>	<b>55.0</b>
<b>10 times Ecological Benchmark Concentration</b>	<b>1.3</b>	<b>0.64</b>	<b>NA</b>	<b>550</b>
<b>Exceed 10 times Ecological Benchmark Concentration?</b>	<b>No</b>	<b>Yes</b>	<b>Can't Calculate</b>	<b>Can't Calculate</b>

**Lot F Transect Deep Zone (Continued)**

	1,1-Dichloroethane	Toluene	Trichloroethene	Vinyl chloride
Average Concentration at Location Nearest River	0.0105 *	0.010 *	0.011 *	0.017 *
Well	AA-GWM-S1-120FT	AA-GWM-S1-80FT	AA-GWM-S1-140FT	AA-GWM-S1-140FT
Distance to River (ft)	1350	1350	1350	1350
Travel Time (days)	225	225	225	225
First Order Degradation Constant (d <sup>-1</sup> )	0.0019	0.011	0.00042	0.00024
<b>Estimated Groundwater Concentration at the River</b>	<b>6.85E-03</b>	<b>8.42E-04</b>	<b>1.00E-02</b>	<b>1.61E-02</b>
<b>Ecological Benchmark Concentration</b>	<b>0.047</b>	<b>0.0098</b>	<b>0.047</b>	<b>5.63</b>
<b>10 times Ecological Benchmark Concentration</b>	<b>0.47</b>	<b>0.098</b>	<b>0.47</b>	<b>56.3</b>
<b>Exceed 10 times Ecological Benchmark Concentration?</b>	<b>No</b>	<b>No</b>	<b>No</b>	<b>No</b>

**NOTES**

- Concentrations in milligram per liter (mg/L).
- Concentrations represent average detections in respective hydrogeologic zone
  - \* Constituent at one or more sample intervals within respective hydrogeologic zone was not detected and was quantified as 0.5 x detection limit. Constituent was detected in at least one sample interval.
  - \*\* Constituent was not detected in any sample intervals within the respective hydrogeologic zone and was quantified as 0.5 x detection limit.
- Travel time calculated by dividing distance to river (from monitoring location nearest the river) by a seepage velocity of 0.02 ft/day, 4 ft/day, and 6 ft/day for the Shallow, Intermediate, and Deep zone, from p 1-7 of the Sauget Area 2 Focused Feasibility Study Volume 1.
- River concentrations calculated by  $C = C_0 e^{-(\lambda t)}$ , where  $C_0$  = average concentration measured in AA-GWM-S1 (mg/L),  $\lambda$  = first order degradation constant (d<sup>-1</sup>),  $t$  = travel time (days).
- Ecological benchmark concentrations without italics obtained from Tier II concentrations from Table 5.1 of "Ecological Risk Assessment for Sauget Area 1", Menzie-Cura & Associates, 2000. Ecological benchmark concentrations with italics obtained from "Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas", Texas Natural Resource Conservation Commission, 2001.
- First order degradation constants obtained from Tiered Approach to Corrective Action Objectives, Section 742 Table E
  - NA = Not available

**TABLE 8**  
**PREDICTED SEMI VOLATILE ORGANIC COMPOUND (SVOC) GROUNDWATER DISCHARGE CONCENTRATIONS**  
**FROM LOT F BASED ON TACO DEGRADATION RATES AND MEASURED AVERAGE CONCENTRATIONS**

Solutia Inc., W. G. Krummrich Plant  
 Sauget, Illinois

**Lot F Transect Deep Zone**

	<b>1,2-Dichlorobenzene</b>	<b>1,3-Dichlorobenzene</b>	<b>1,4-Dichlorobenzene</b>	<b>2-Chlorophenol</b>
Average Concentration at Location Nearest River	<b>0.0072 *</b>	<b>0.0046 *</b>	<b>0.0737 *</b>	<b>0.0326</b>
Well	AA-GWM-S1	AA-GWM-S1	AA-GWM-S1	AA-GWM-S1
Distance to River (ft)	1350	1350	1350	1350
Travel Time (days)	225	225	225	225
First Order Degradation Constant (d <sup>-1</sup> )	0.0019	NA	0.0019	NA
<b>Estimated Groundwater Concentration at the River</b>	<b>4.66E-03</b>	<i>Can't Calculate</i>	<b>4.81E-02</b>	<i>Can't Calculate</i>
<b>Ecological Benchmark Concentration</b>	<b>0.014</b>	<b>0.071</b>	<b>0.015</b>	<b>0.13</b>
<b>10 times Ecological Benchmark Concentration</b>	<b>0.14</b>	<b>0.71</b>	<b>0.15</b>	<b>1.3</b>
<b>Exceed 10 times Ecological Benchmark Concentration?</b>	<b>No</b>	<i>Can't Calculate</i>	<b>No</b>	<i>Can't Calculate</i>

**Lot F Transect Deep Zone (Continued)**

	<b>2,4-Dichlorophenol</b>	<b>4-Chloroaniline</b>	<b>bis(2-Ethylhexyl)phthalate</b>	<b>Napthalene</b>
Average Concentration at Location Nearest River	<b>0.0045 *</b>	<b>0.0064</b>	<b>0.005 *</b>	<b>0.0047 *</b>
Well	AA-GWM-S1	AA-GWM-S1	AA-GWM-S1	AA-GWM-S1
Distance to River (ft)	1350	1350	1350	1350
Travel Time (days)	225	225	225	225
First Order Degradation Constant (d <sup>-1</sup> )	0.00027	NA	0.0018	0.0027
<b>Estimated Groundwater Concentration at the River</b>	<b>4.23E-03</b>	<i>Can't Calculate</i>	<b>3.33E-03</b>	<b>2.56E-03</b>
<b>Ecological Benchmark Concentration</b>	<b>0.085</b>	<b>NA</b>	<b>0.003</b>	<b>0.012</b>
<b>10 times Ecological Benchmark Concentration</b>	<b>0.85</b>	<b>NA</b>	<b>0.03</b>	<b>0.12</b>
<b>Exceed 10 times Ecological Benchmark Concentration?</b>	<b>No</b>	<i>Can't Calculate</i>	<b>No</b>	<b>No</b>

**NOTES**

- Concentrations in milligram per liter (mg/L)
- Concentrations represent average detections in respective hydrogeologic zone
  - \* Constituent at one or more sample intervals within respective hydrogeologic zone was not detected and was quantified as 0.5 x detection limit. Constituent was detected in at least one sample interval.
  - \*\* Constituent was not detected in any sample intervals within the respective hydrogeologic zone and was quantified as 0.5 x detection limit
- Travel time calculated by dividing distance to river (from monitoring location nearest the river) by a seepage velocity of 0.02 ft/day, 4 ft/day, and 6 ft/day for the Shallow, Intermediate, and Deep zone, from p 1-7 of the Sauget Area 2 Focused Feasibility Study Volume 1
- River concentrations calculated by  $C = C_0 e^{-(\lambda t)}$ , where  $C_0$  = average concentration measured in AA-GWM-S1 (mg/L),  $\lambda$  = first order degradation constant (d<sup>-1</sup>),  $t$  = travel time (days)
- Ecological benchmark concentrations without italics obtained from Tier II concentrations from Table 5.1 of "Ecological Risk Assessment for Sauget Area 1", Menzie-Cura & Associates, 2000. Ecological benchmark concentrations with italics obtained from "Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas", Texas Natural Resource Conservation Commission, 2001
- First order degradation constants obtained from Tiered Approach to Corrective Action Objectives, Section 742 Table E
  - NA = Not available



**TABLE 9**  
**PREDICTED VOLATILE ORGANIC COMPOUND (VOC) GROUNDWATER DISCHARGE CONCENTRATIONS**  
**FROM LOT F BASED ON TACO DEGRADATION RATES AND MEASURED MAXIMUM CONCENTRATIONS**

Solutia Inc., W. G. Krummich Plant  
 Sauget, Illinois

**Lot F Transect Shallow Zone**

	Benzene	Chlorobenzene	Methylene chloride
Maximum Concentration at Location Nearest River	0.0006	0.0027	0.0011
Well	AA-GWM-S1-40FT	AA-GWM-S1-40FT	AA-GWM-S1-40FT
Distance to River (ft)	1350	1350	1350
Travel Time (days)	67500	67500	67500
First Order Degradation Constant (d <sup>-1</sup> )	0.0009	0.0023	0.01
<b>Estimated Groundwater Concentration at the River</b>	<b>2.48E-30</b>	<b>1.02E-70</b>	<b>7.81E-297</b>
<b>Ecological Benchmark Concentration</b>	<b>0.13</b>	<b>0.064</b>	<b>2.20</b>
<b>10 times Ecological Benchmark Concentration</b>	<b>1.3</b>	<b>0.64</b>	<b>22</b>
<b>Exceed 10 times Ecological Benchmark Concentration?</b>	<b>No</b>	<b>No</b>	<b>No</b>

**Lot F Transect Intermediate Zone**

	Chloromethane
Maximum Concentration at Location Nearest River	0.0009
Well	AA-GWM-S1-60FT
Distance to River (ft)	1350
Travel Time (days)	338
First Order Degradation Constant (d <sup>-1</sup> )	NA
<b>Estimated Groundwater Concentration at the River</b>	<b>Can't Calculate</b>
<b>Ecological Benchmark Concentration</b>	<b>55.0</b>
<b>10 times Ecological Benchmark Concentration</b>	<b>550</b>
<b>Exceed 10 times Ecological Benchmark Concentration?</b>	<b>Can't Calculate</b>

**Lot F Transect Deep Zone**

	Benzene	Chlorobenzene	Chloroethane	Chloromethane
Maximum Concentration at Location Nearest River	0.079	3.7	0.011	0.0064
Well	AA-GWM-S1-80FT	AA-GWM-S1-1200FT	AA-GWM-S1-100FT	AA-GWM-S1-140FT
Distance to River (ft)	1350	1350	1350	1350
Travel Time (days)	225	225	225	225
First Order Degradation Constant (d <sup>-1</sup> )	0.0009	0.0023	NA	NA
<b>Estimated Groundwater Concentration at the River</b>	<b>6.45E-02</b>	<b>2.21E+00</b>	<b>Can't Calculate</b>	<b>Can't Calculate</b>
<b>Ecological Benchmark Concentration</b>	<b>0.13</b>	<b>0.064</b>	<b>NA</b>	<b>55.0</b>
<b>10 times Ecological Benchmark Concentration</b>	<b>1.3</b>	<b>0.64</b>	<b>NA</b>	<b>550</b>
<b>Exceed 10 times Ecological Benchmark Concentration?</b>	<b>No</b>	<b>Yes</b>	<b>Can't Calculate</b>	<b>Can't Calculate</b>

**Lot F Transect Deep Zone (Continued)**

	1,1-Dichloroethane	Toluene	Trichloroethene	Vinyl chloride
Maximum Concentration at Location Nearest River	0.014	0.0036	0.015	0.027
Well	AA-GWM-S1-120FT	AA-GWM-S1-80FT	AA-GWM-S1-140FT	AA-GWM-S1-140FT
Distance to River (ft)	1350	1350	1350	1350
Travel Time (days)	225	225	225	225
First Order Degradation Constant (d <sup>-1</sup> )	0.0019	0.011	0.00042	0.00024
<b>Estimated Groundwater Concentration at the River</b>	<b>9.13E-03</b>	<b>3.03E-04</b>	<b>1.36E-02</b>	<b>2.56E-02</b>
<b>Ecological Benchmark Concentration</b>	<b>0.047</b>	<b>0.0098</b>	<b>0.047</b>	<b>5.63</b>
<b>10 times Ecological Benchmark Concentration</b>	<b>0.47</b>	<b>0.098</b>	<b>0.47</b>	<b>56.3</b>
<b>Exceed 10 times Ecological Benchmark Concentration?</b>	<b>No</b>	<b>No</b>	<b>No</b>	<b>No</b>

**NOTES**

- Concentrations in milligram per liter (mg/L)
- Concentrations represent maximum detections in respective hydrogeologic zone.
  - \* Constituent at one or more sample intervals within respective hydrogeologic zone was not detected and was quantified as 0.5 x detection limit. Constituent was detected in at least one sample interval.
  - \*\* Constituent was not detected in any sample intervals within the respective hydrogeologic zone and was quantified as 0.5 x detection limit.
- Travel time calculated by dividing distance to river (from monitoring location nearest the river) by a seepage velocity of 0.02 ft/day, 4 ft/day, and 6 ft/day for the Shallow, Intermediate, and Deep zone, from p 1-7 of the Sauget Area 2 Focused Feasibility Study Volume 1
- River concentrations calculated by  $C = C_0 \cdot e^{-(\lambda \cdot t)}$ , where  $C_0$  = maximum concentration measured in AA-GWM-S1 (mg/L),  $\lambda$  = first order degradation constant (d<sup>-1</sup>),  $t$  = travel time (days)
- Ecological benchmark concentrations without italics obtained from Tier II concentrations from Table 5.1 of "Ecological Risk Assessment for Sauget Area 1", Menzie-Cura & Associates, 2000. Ecological benchmark concentrations with italics obtained from "Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas", Texas Natural Resource Conservation Commission, 2001
- First order degradation constants obtained from Tiered Approach to Corrective Action Objectives, Section 742 Table E  
 NA = Not available

**TABLE 10**  
**PREDICTED SEMI VOLATILE ORGANIC COMPOUND (SVOC) GROUNDWATER DISCHARGE CONCENTRATIONS**  
**FROM LOT F BASED ON TACO DEGRADATION RATES AND MEASURED MAXIMUM CONCENTRATIONS**

Solutia Inc., W. G. Krummrich Plant  
 Sauget, Illinois

**Lot F Transect Deep Zone**

	<b>1,2-Dichlorobenzene</b>	<b>1,3-Dichlorobenzene</b>	<b>1,4-Dichlorobenzene</b>	<b>2-Chlorophenol</b>
Maximum Concentration at Location Nearest River	<b>0.013</b>	<b>0.0055</b>	<b>0.180</b>	<b>0.046</b>
Well	AA-GWM-S1	AA-GWM-S1	AA-GWM-S1	AA-GWM-S1
Distance to River (ft)	1350	1350	1350	1350
Travel Time (days)	225	225	225	225
First Order Degradation Constant (d <sup>-1</sup> )	0.0019	NA	0.0019	NA
<b>Estimated Groundwater Concentration at the River</b>	<b>8.48E-03</b>	<i>Can't Calculate</i>	<b>1.17E-01</b>	<i>Can't Calculate</i>
<b>Ecological Benchmark Concentration</b>	<b>0.014</b>	<b>0.071</b>	<b>0.015</b>	<b>0.13</b>
<b>10 times Ecological Benchmark Concentration</b>	<b>0.14</b>	<b>0.71</b>	<b>0.15</b>	<b>1.3</b>
<b>Exceed 10 times Ecological Benchmark Concentration?</b>	<b>No</b>	<i>Can't Calculate</i>	<b>Yes</b>	<i>Can't Calculate</i>

**Lot F Transect Deep Zone (Continued)**

	<b>2,4-Dichlorophenol</b>	<b>4-Chloroaniline</b>	<b>bis(2-Ethylhexyl)phthalate</b>	<b>Napthalene</b>
Maximum Concentration at Location Nearest River	<b>0.0053</b>	<b>0.012</b>	<b>0.0009</b>	<b>0.0038</b>
Well	AA-GWM-S1	AA-GWM-S1	AA-GWM-S1	AA-GWM-S1
Distance to River (ft)	1350	1350	1350	1350
Travel Time (days)	225	225	225	225
First Order Degradation Constant (d <sup>-1</sup> )	0.00027	NA	0.0018	0.0027
<b>Estimated Groundwater Concentration at the River</b>	<b>4.99E-03</b>	<i>Can't Calculate</i>	<b>6.00E-04</b>	<b>2.07E-03</b>
<b>Ecological Benchmark Concentration</b>	<b>0.005</b>	<b>NA</b>	<b>0.003</b>	<b>0.012</b>
<b>10 times Ecological Benchmark Concentration</b>	<b>0.05</b>	<b>NA</b>	<b>0.03</b>	<b>0.12</b>
<b>Exceed 10 times Ecological Benchmark Concentration?</b>	<b>No</b>	<i>Can't Calculate</i>	<b>No</b>	<b>No</b>

**NOTES:**

- Concentrations in milligram per liter (mg/L)
- Concentrations represent maximum detections in respective hydrogeologic zone.
  - \* Constituent at one or more sample intervals within respective hydrogeologic zone was not detected and was quantified as 0.5 x detection limit. Constituent was detected in at least one sample interval.
  - \*\* Constituent was not detected in any sample intervals within the respective hydrogeologic zone and was quantified as 0.5 x detection limit.
- Travel time calculated by dividing distance to river (from monitoring location nearest the river) by a seepage velocity of 0.02 ft/day, 4 ft/day, and 6 ft/day for the Shallow, Intermediate, and Deep zone, from p 1-7 of the Sauget Area 2 Focused Feasibility Study Volume 1.
- River concentrations calculated by  $C = C_0 \cdot e^{-(\lambda \cdot t)}$ , where  $C_0$  = maximum concentration measured in AA-GWM-S1 (mg/L),  $\lambda$  = first order degradation constant (d<sup>-1</sup>),  $t$  = travel time (days)
- Ecological benchmark concentrations without italics obtained from Tier II concentrations from Table 5.1 of "Ecological Risk Assessment for Sauget Area 1", Menzie-Cura & Associates, 2000. Ecological benchmark concentrations with italics obtained from "Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas", Texas Natural Resource Conservation Commission, 2001.
- First order degradation constants obtained from Tiered Approach to Corrective Action Objectives, Section 742 Table E.
  - NA = Not available

September 20, 2002



GROUNDWATER  
SERVICES, INC.

**VOC AND SVOC GROUNDWATER TRANSPORT ANALYSIS AND  
COMPARISON TO ECOLOGICAL BENCHMARK**

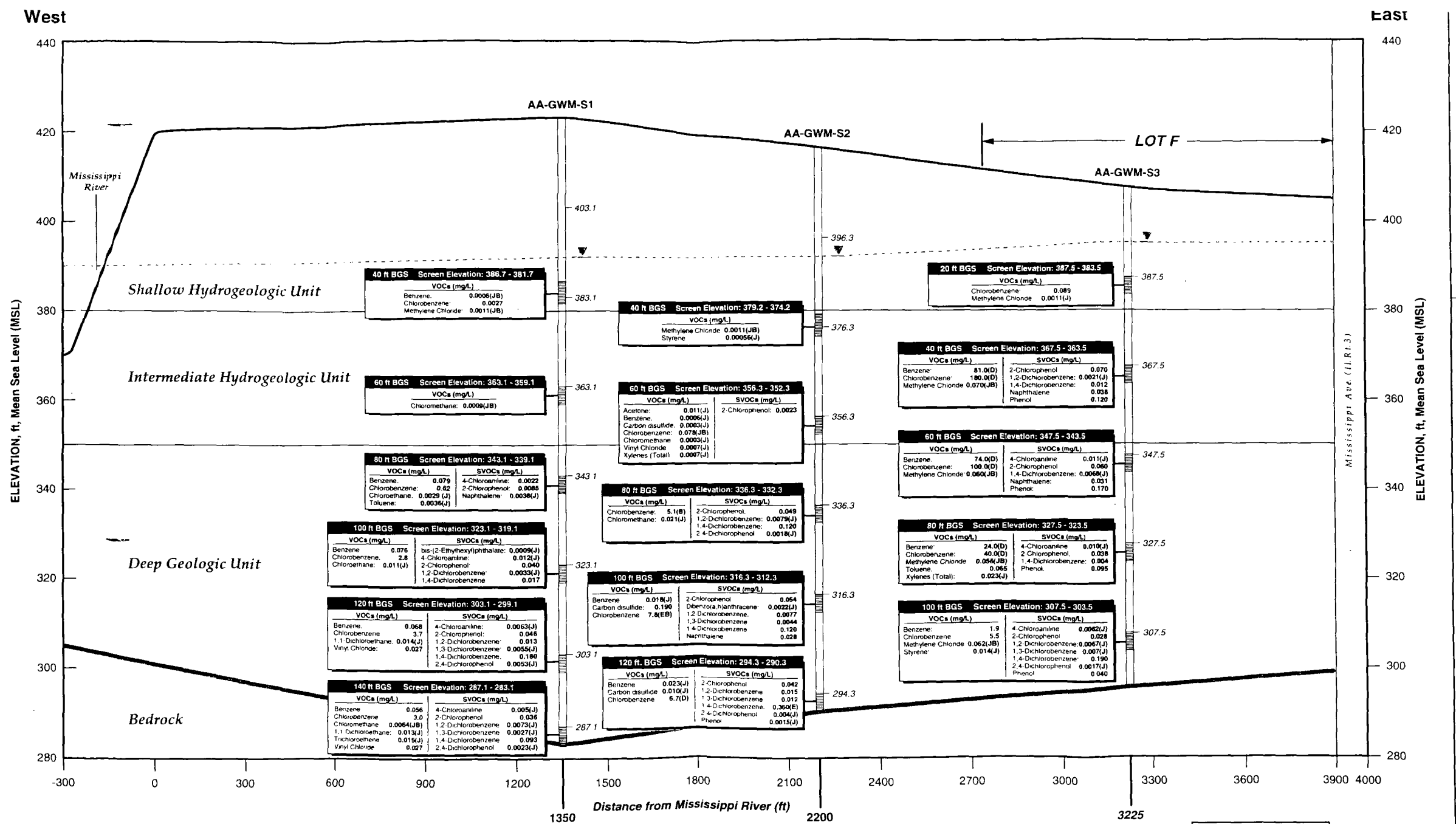
Solutia, Inc.  
W.G. Krummrich Plant  
Sauget, Illinois

**Figures**

**Figure Number and Title**

Figure 1: Groundwater Monitoring Locations, July 2002

Figure 2: Volatile and Semivolatile Organic Compound Concentrations in Lot F  
Transect, July 2002



NOTES:

- 1) All analyses performed by STL Savannah in Savannah, Georgia. Analytical methods were VOCs by EPA 8260B and SVOCs by EPA 8270C.
- 2) Data qualifiers are as follows: (J) = estimated value between the laboratory Method Detection Limit and Sample Quantitation Limit; (B) = analyte found in associated blank; (D) = sample was reanalyzed at a higher dilution factor; (E) = value is estimated because of the presence of interference.
- 3) River boundary changes with river stage. River boundary is approximate.



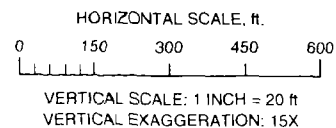
GSI Job No G-2561  
Issued: 9/20/02  
Revised: \_\_\_\_\_  
Scale: As Shown

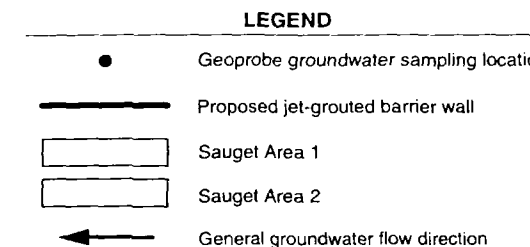
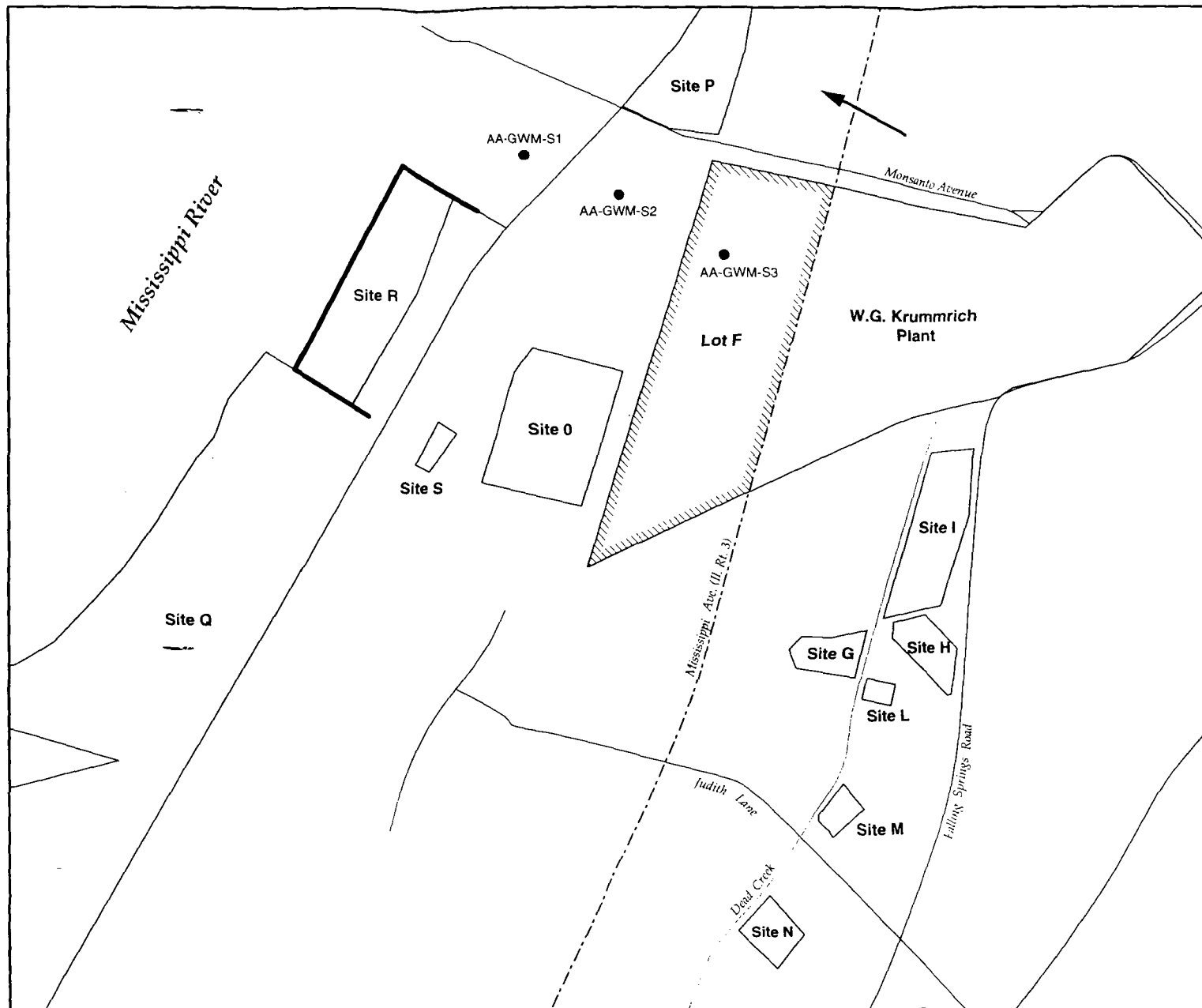
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FIGURE 2

VOLATILE AND SEMIVOLATILE ORGANIC COMPOUND CONCENTRATIONS IN LOT F TRANSECT, JULY 2002

Solutia Inc., W.G. Krummrich Plant

PRELIMINARY

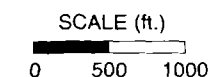




**NOTES:**

- 1) A registered professional land surveyor was contracted to survey each of the three sampling locations. The surveyor determined ground elevation relative to Mean Sea Level, State plane coordinates, and plant coordinates relative to the coordinate system at the W.G. Krummrich Plant.
- 2) Base map from Figure 1, Focused Feasibility Study, Volume 1, Interim Groundwater Remedy Sauget Area 2 Sites O, Q, R and S. Solutia, Inc., March 31, 2002.
- 3) River boundary changes with river stage. River boundary on this map is approximate.

**PRELIMINARY**



**FIGURE 1**



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**FIGURE 1**

**GROUNDWATER MONITORING LOCATIONS,  
 JULY 2002**  
 Solutia Inc., W.G. Krummrich Plant